

FIG.1

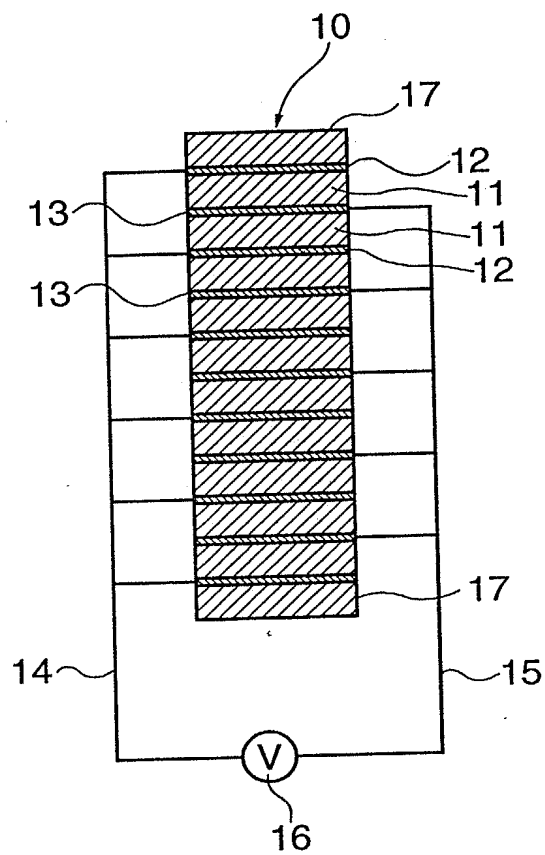
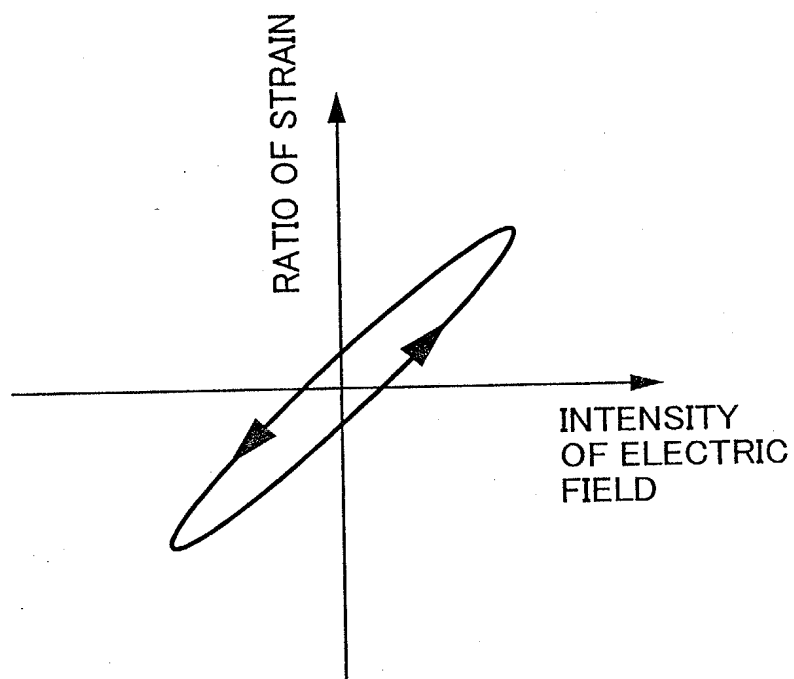


FIG.2



000000 20976560

FIG. 3

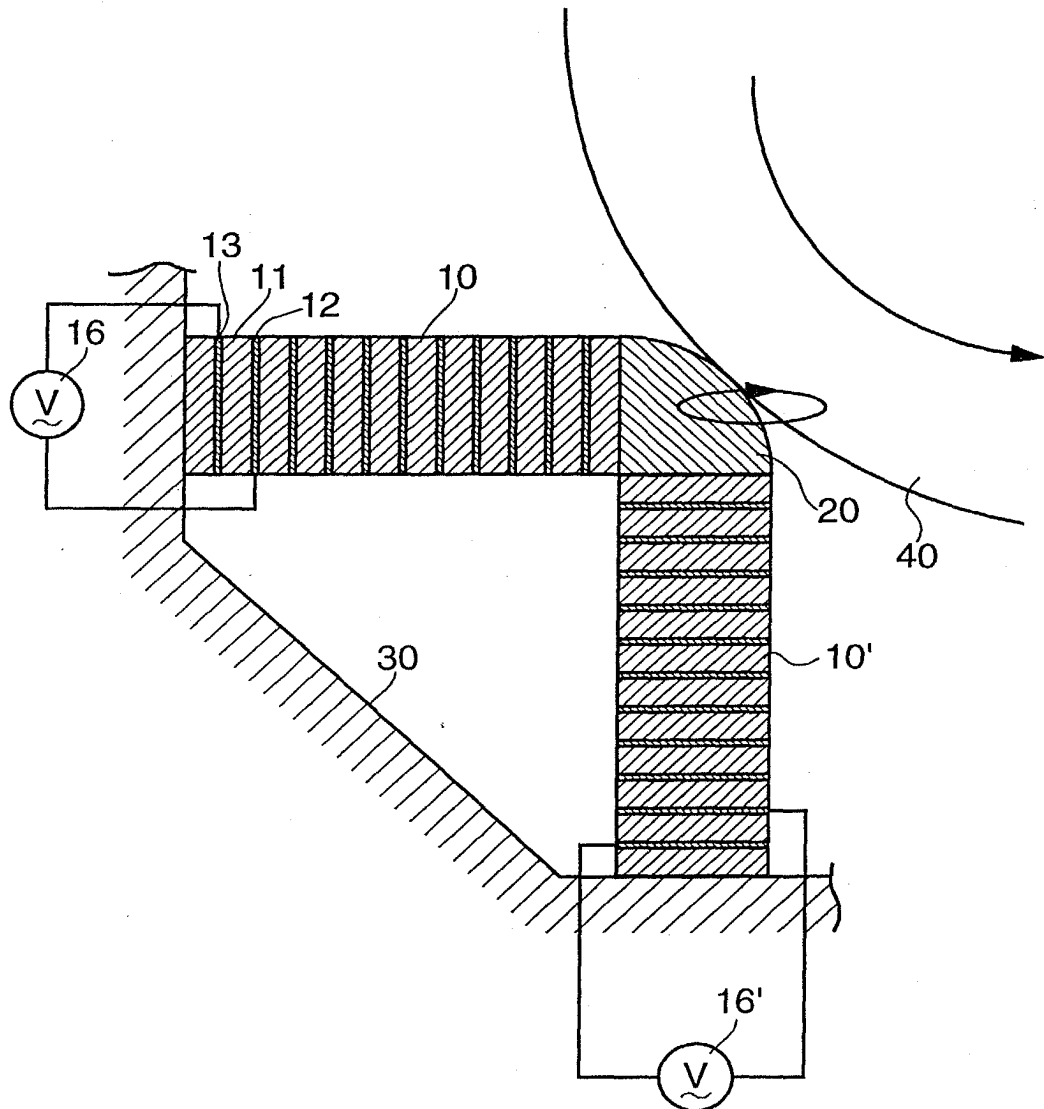


Fig. 4

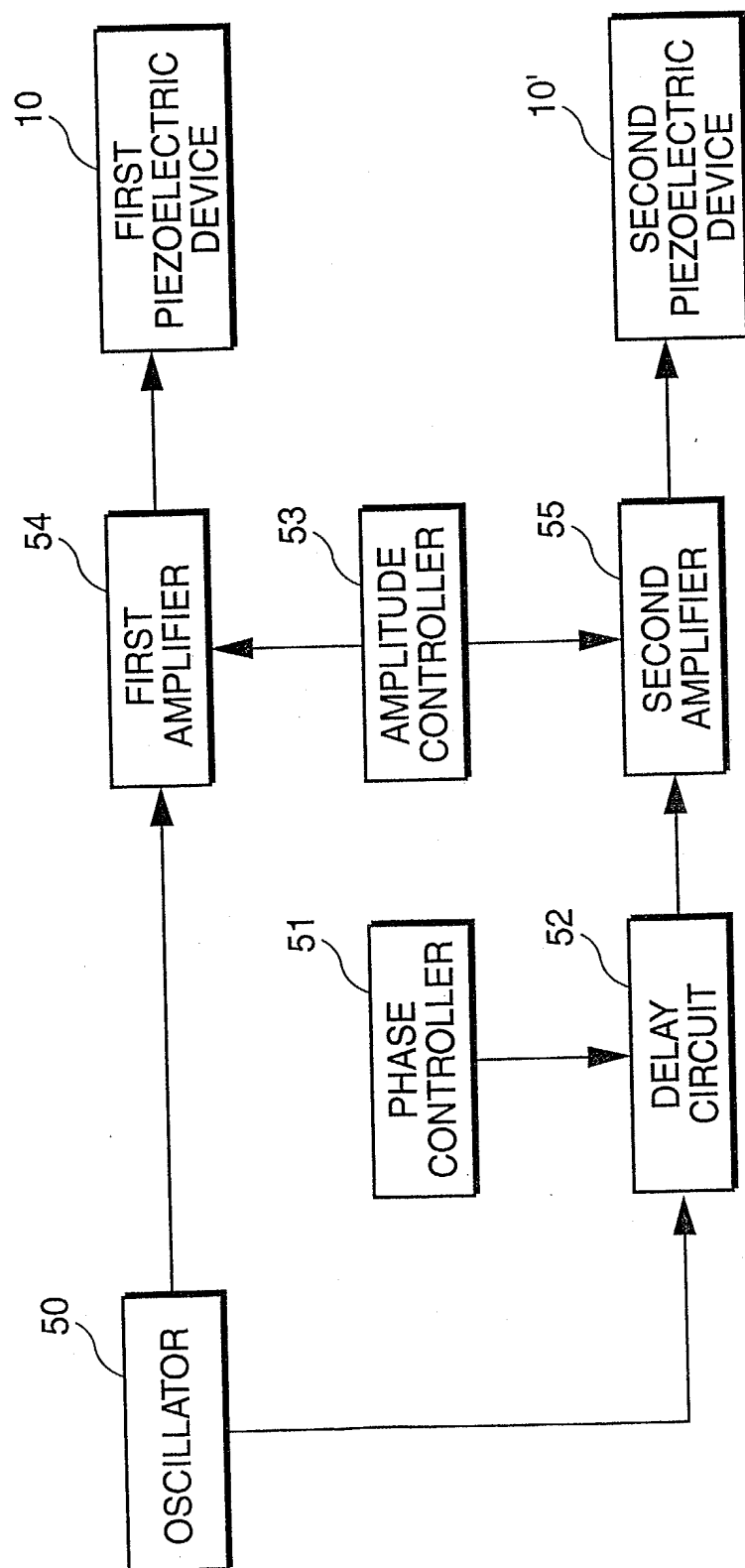


FIG. 5

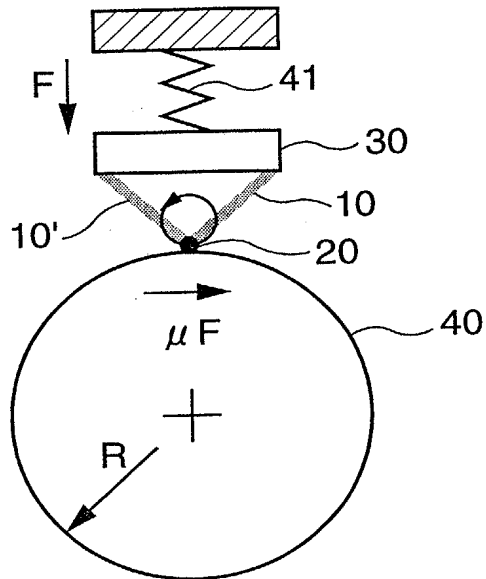


FIG. 6

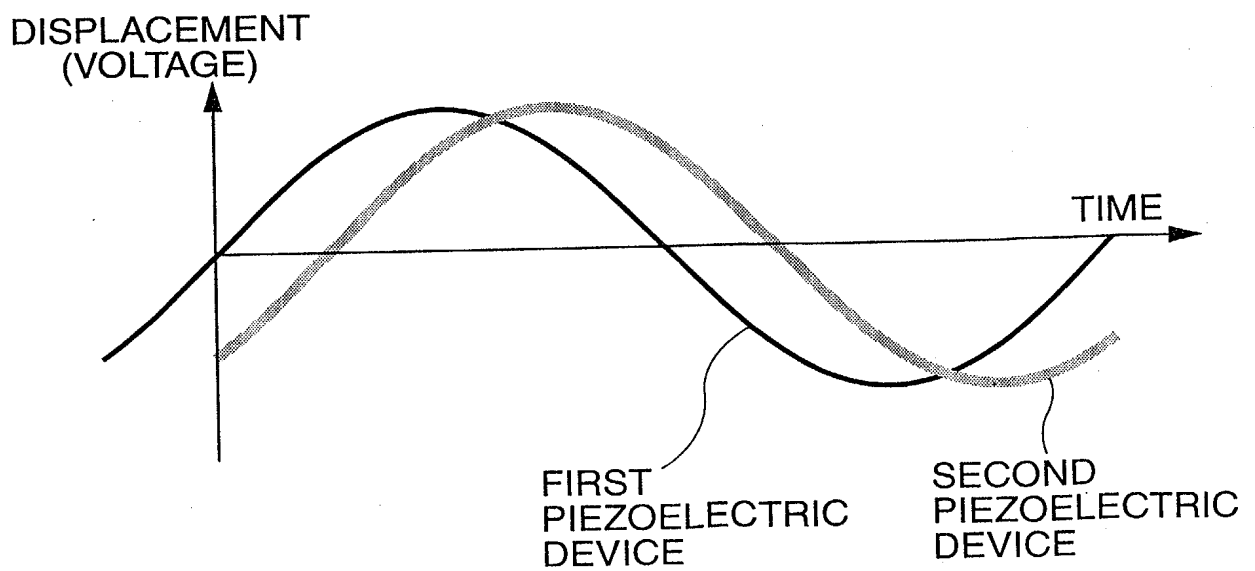


FIG. 7A

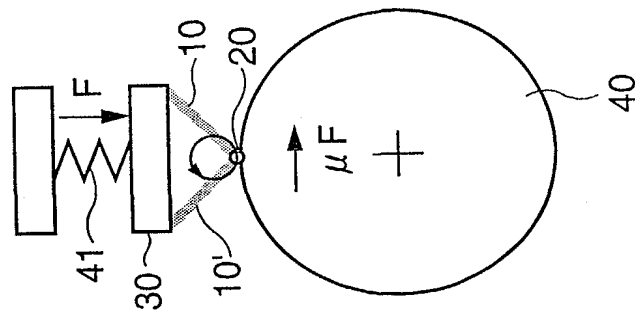


FIG. 7B

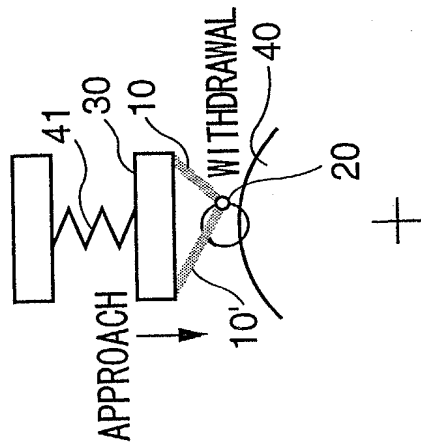


FIG. 7C

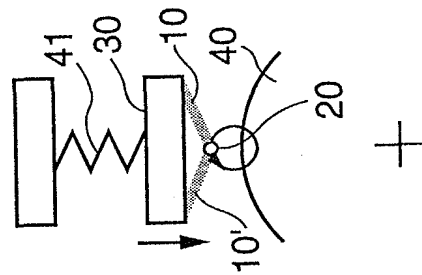


FIG. 7D

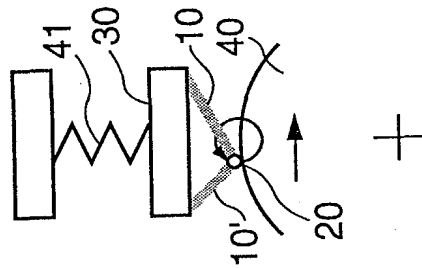


FIG. 7E

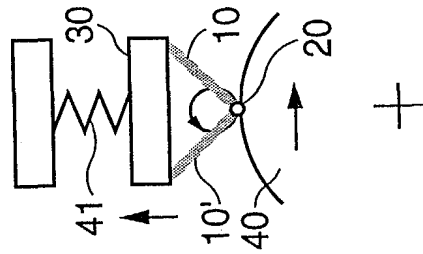


FIG. 8A

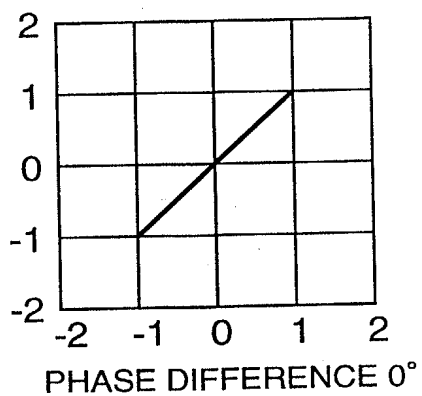


FIG. 8B

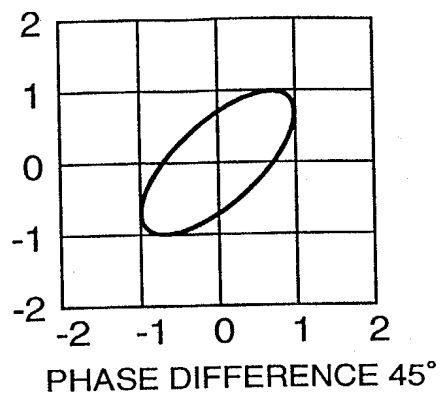


FIG. 8C

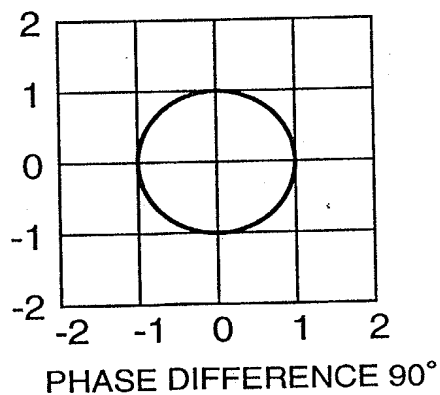


FIG. 8D

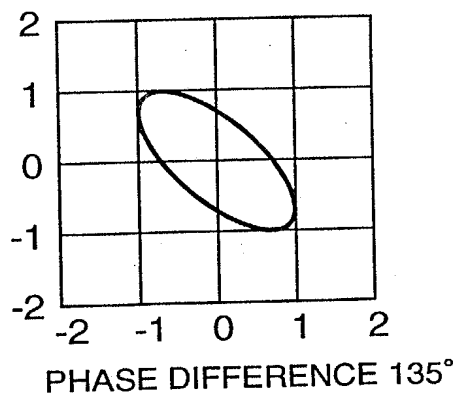


FIG. 8E

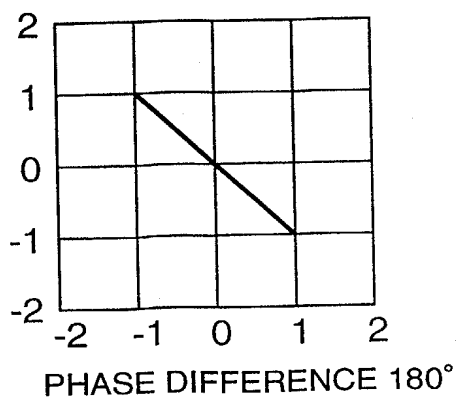


FIG. 9A

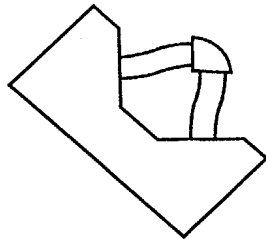


FIG. 9B

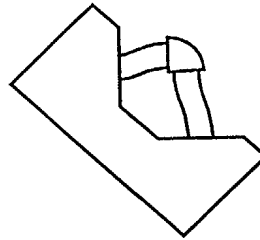


FIG. 9C

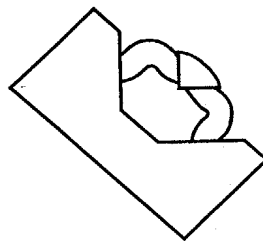


FIG. 9D

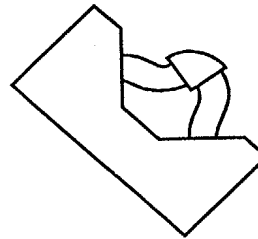


FIG. 10A

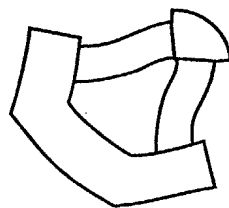


FIG. 10B

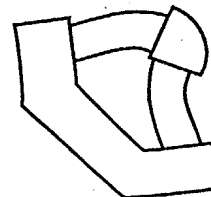


FIG. 10C

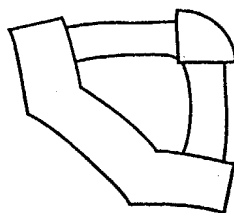


FIG. 10D

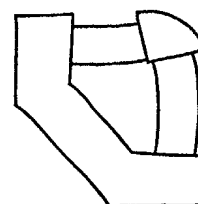




FIG. 11

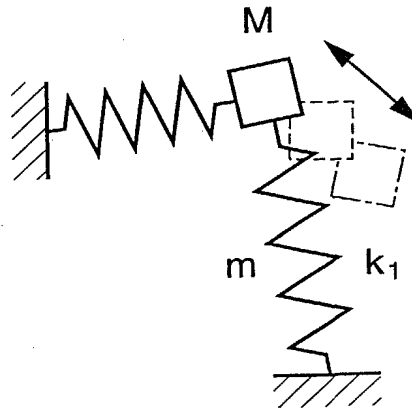


FIG. 12

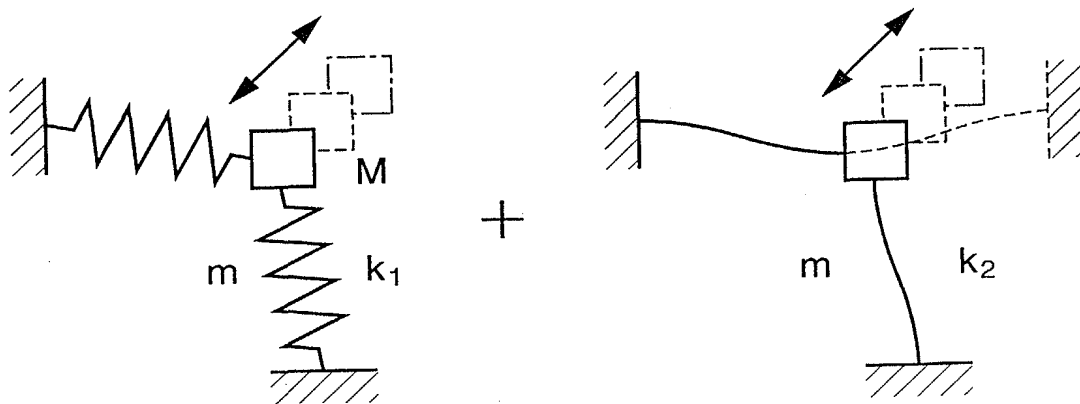
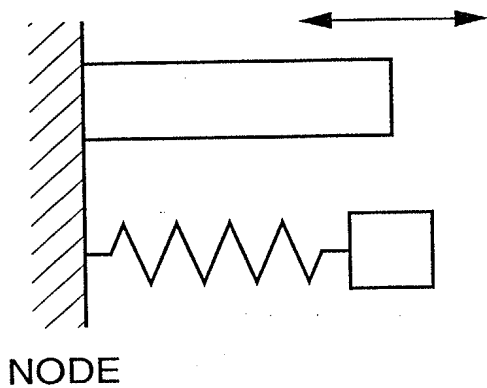


FIG. 13A

AN END CONSTRAINED



SPRING CONSTANT :  $k = SE/L$

MASS :  $m$

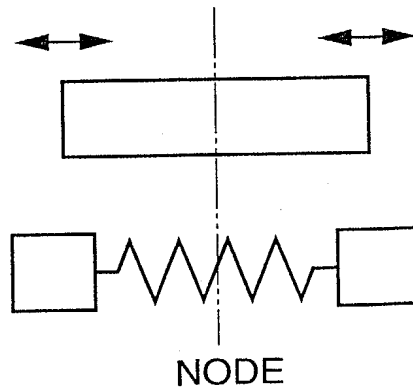
ANGULAR FREQUENCY :  $\omega^2 = k / (m/3)$

$S$  : CROSS-SECTIONAL AREA

$L$  : LENGTH

FIG. 13B

BOTH ENDS FREE



$$k' = SE / (L/2) \\ = 2k$$

$$m' = m/2$$

$$\omega'^2 = k' / (m'/3) \\ = (2\omega)^2$$

FIG. 14A

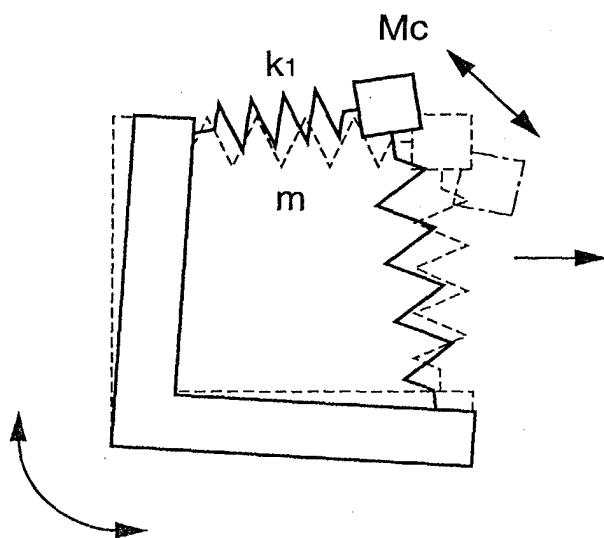


FIG. 14B

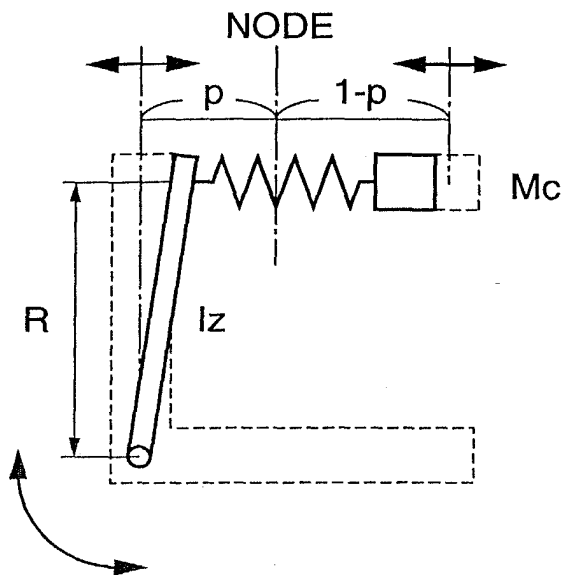


FIG. 15A

EXPANSIVE MOTION

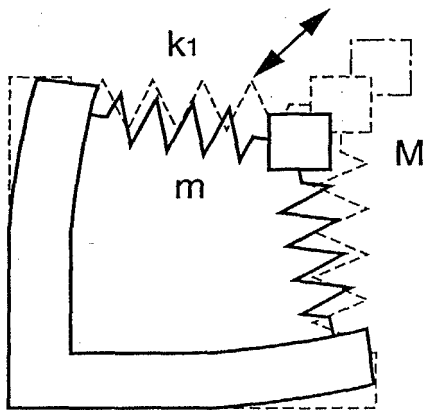


FIG. 15B

EXPANSIVE MOTION

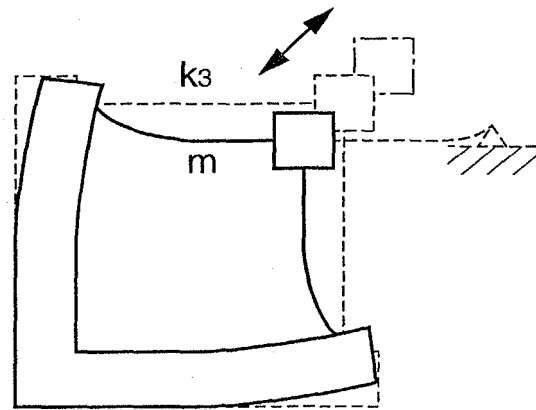


FIG. 15C

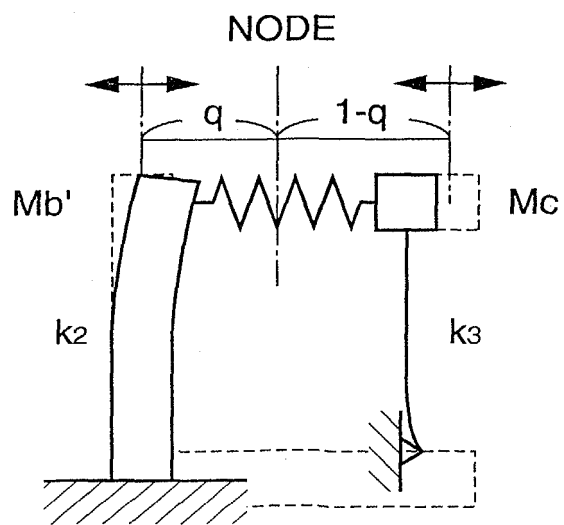


FIG.16

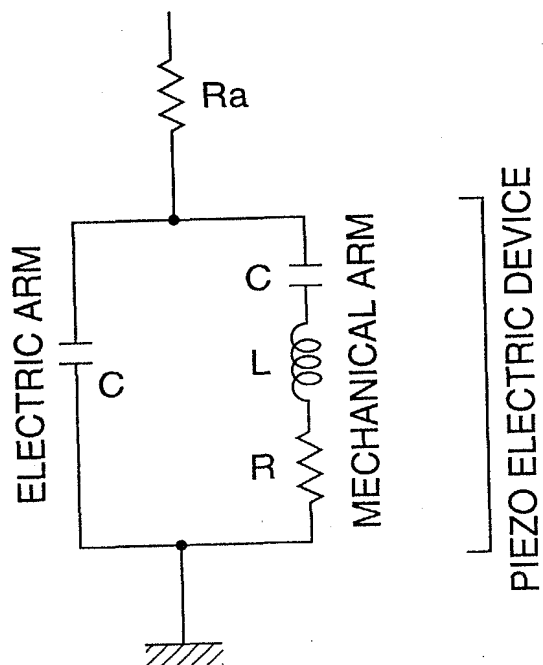


FIG. 17

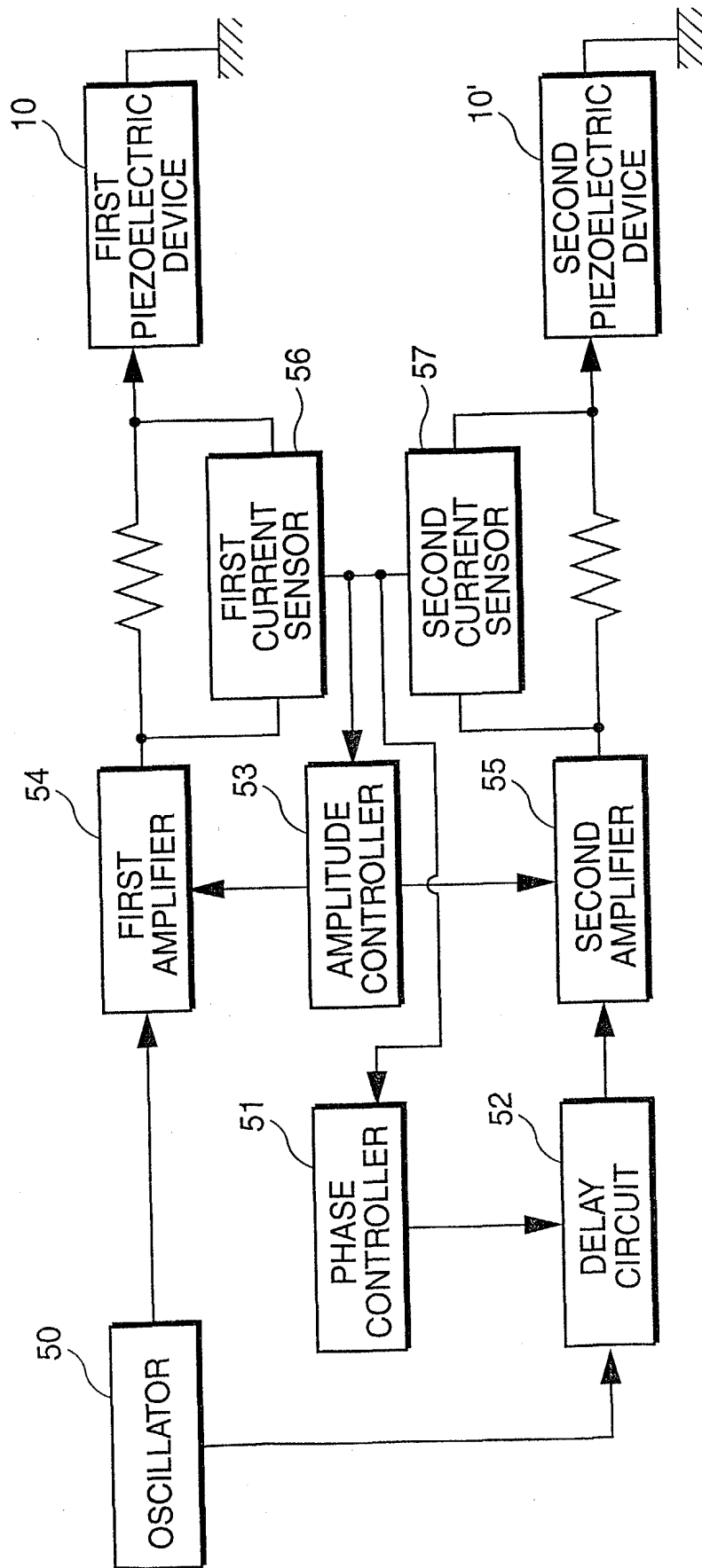


FIG. 18A

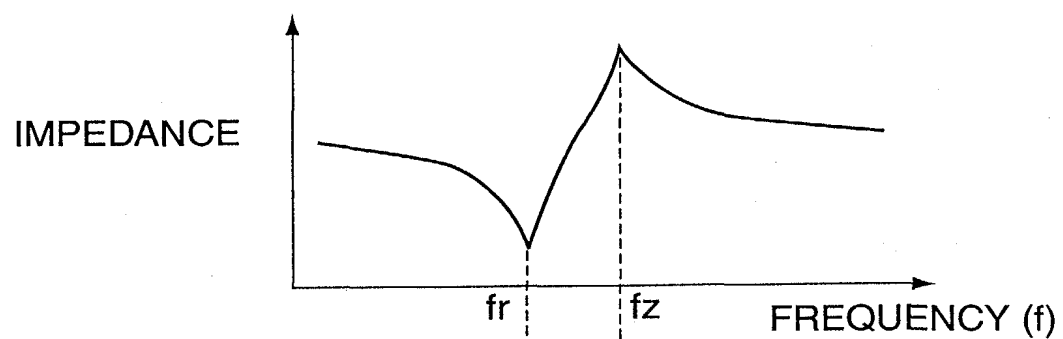


FIG. 18B

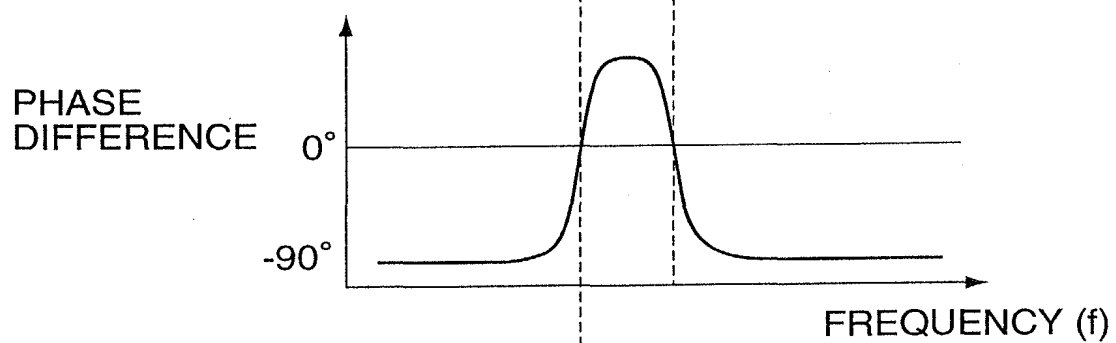


FIG. 18C

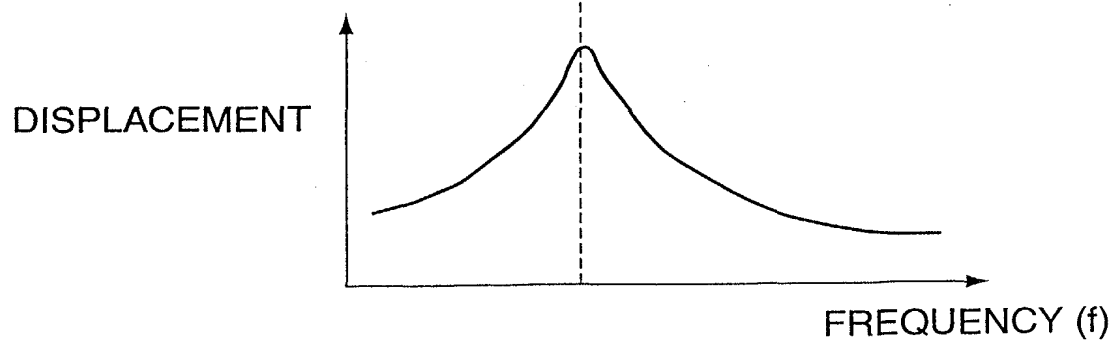


FIG. 19A

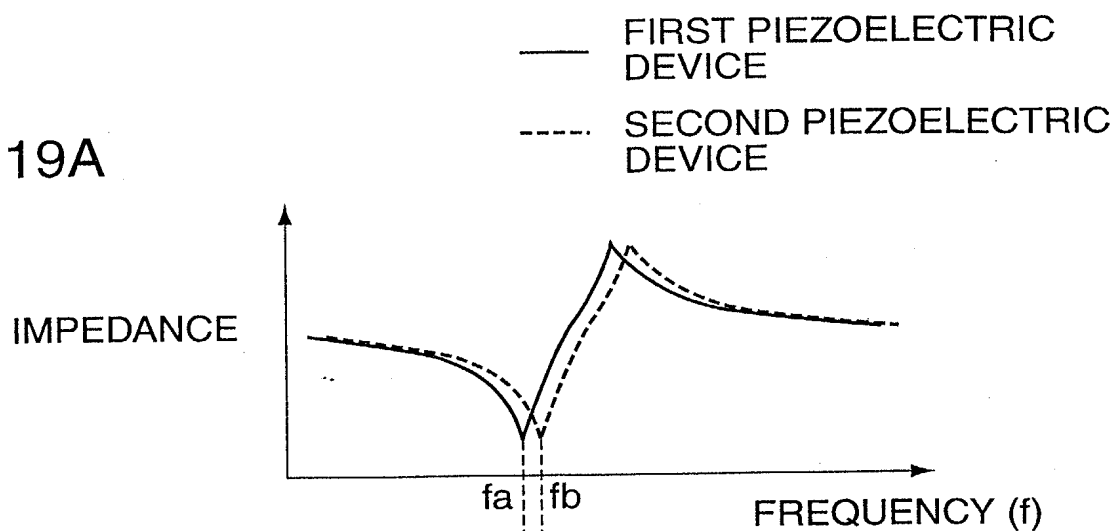


FIG. 19B

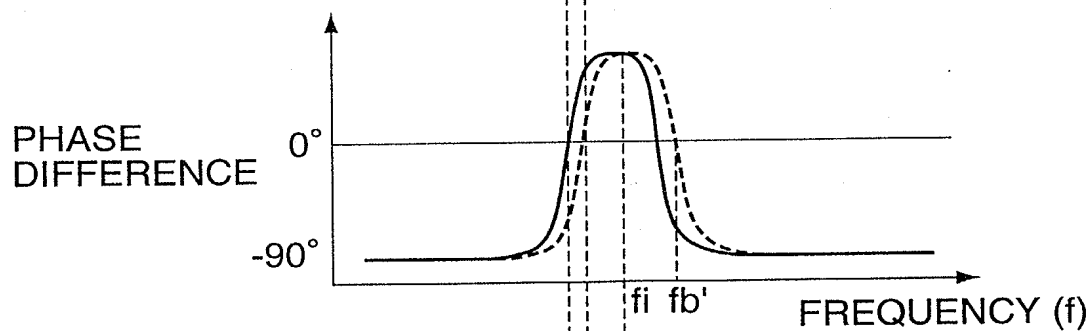
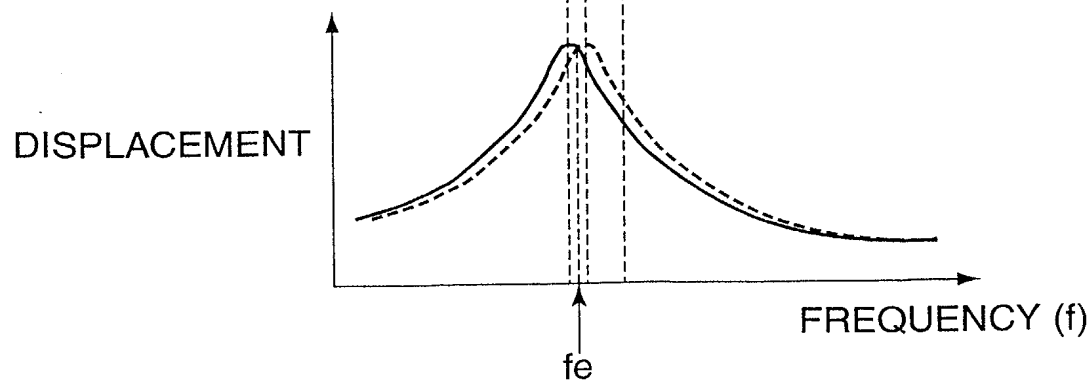


FIG. 19C





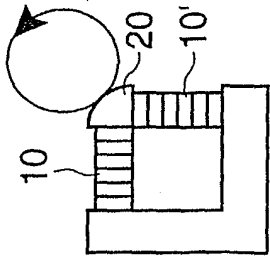
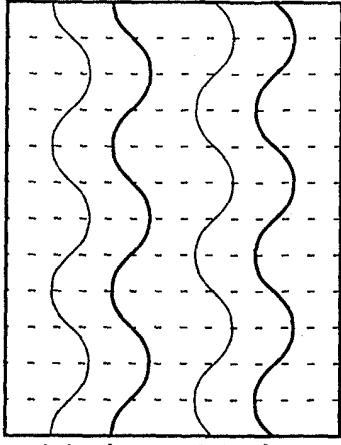


FIG. 20A

FIG. 21A



FIRST  
PIEZOELECTRIC  
DEVICE  
VOLTAGE  
CURRENT  
SECOND  
PIEZOELECTRIC  
DEVICE  
VOLTAGE  
CURRENT

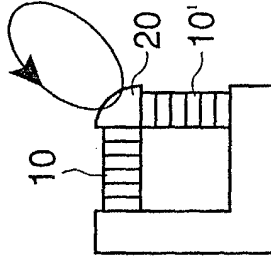
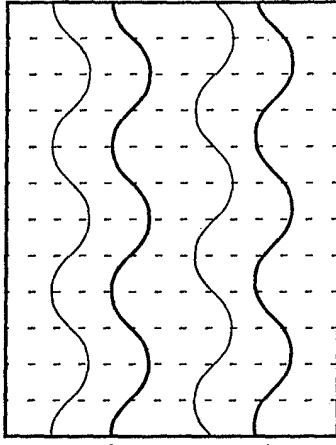


FIG. 20B

FIG. 21B



FIRST  
PIEZOELECTRIC  
DEVICE  
VOLTAGE  
CURRENT  
SECOND  
PIEZOELECTRIC  
DEVICE  
VOLTAGE  
CURRENT

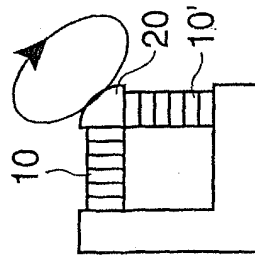
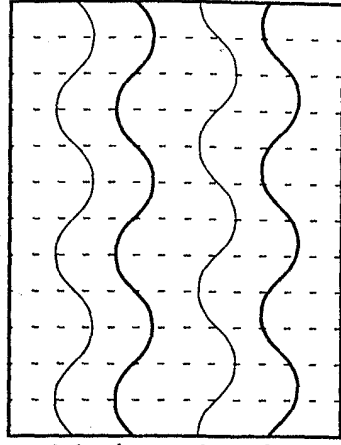


FIG. 20C

FIG. 21C



FIRST  
PIEZOELECTRIC  
DEVICE  
VOLTAGE  
CURRENT  
SECOND  
PIEZOELECTRIC  
DEVICE  
VOLTAGE  
CURRENT

FIG. 22

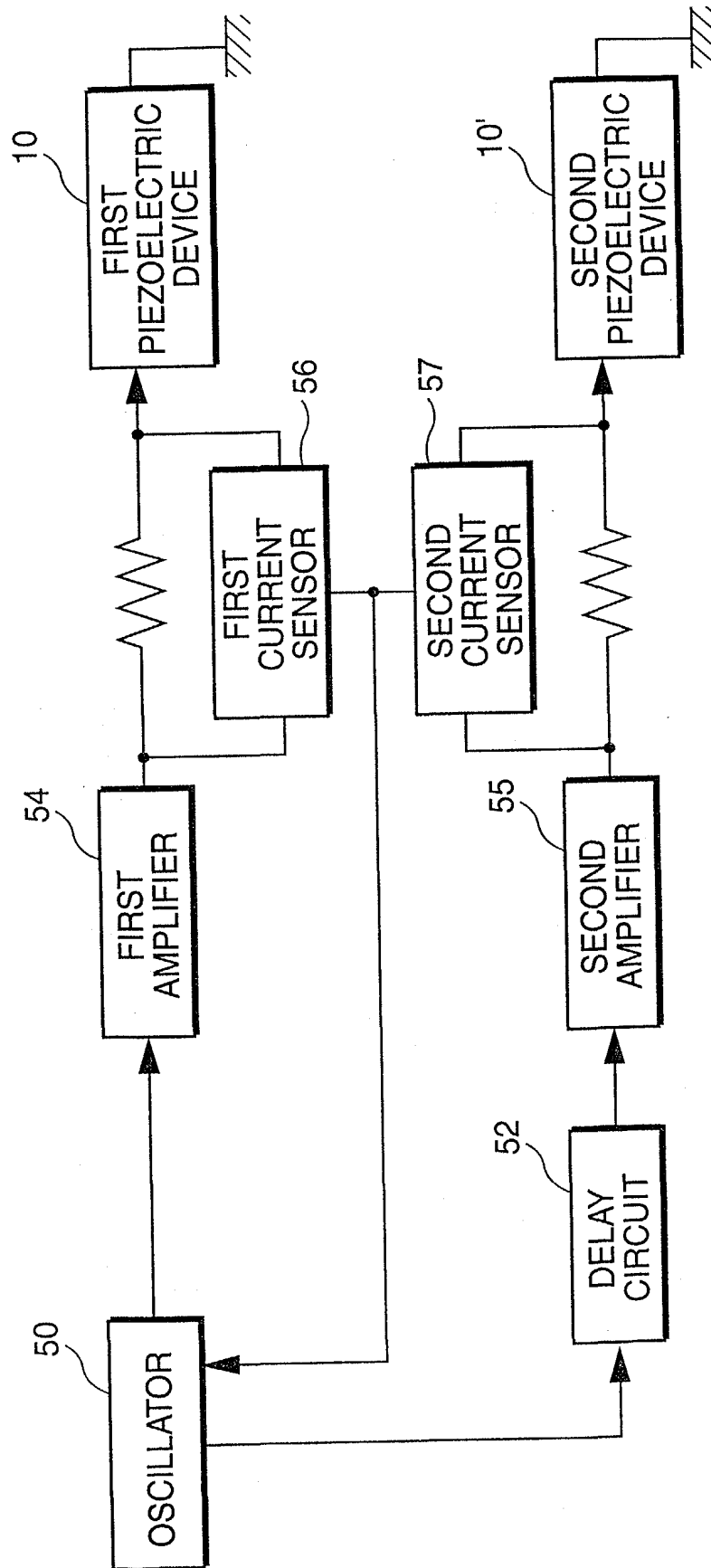


FIG. 23

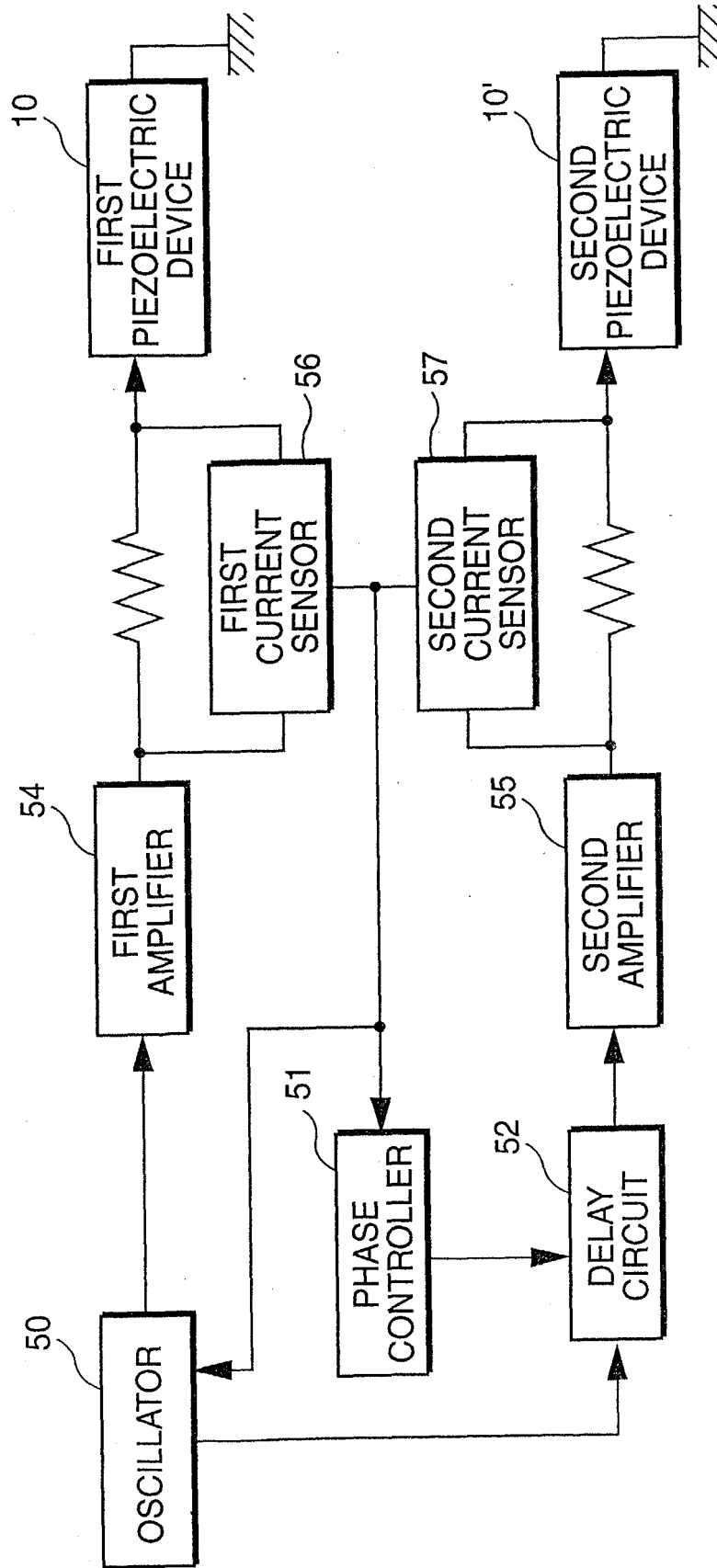


FIG. 24

